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IMPLANTField of the Invention

5 The present invention relates to an implant for a bone tissue structure having an intraosseous anchoring structure of a generally circular cross-section comprising a first cylindrical section of a first diameter and a second cylindrical section of a second diameter less than the first diameter (hereinafter-in-part an "implant of the type defined").

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The invention is particularly, although not exclusively, concerned with an implant of the type defined which takes the form of a femur fixture for a hip-joint prosthesis.

15 Background of the Invention

Implants of the type defined in the form of femur fixtures for a hip-joint prosthesis are known from Applicant's prior International patent application publications WO93/01769, WO93/16663 and WO97/25939 with the first and second cylindrical

20 sections being provided with external screw threads for engaging the bone tissue of the femur. The screw threaded first and second cylindrical sections of the femur fixture disclosed in WO93/01769 are assembled together in the femur by firstly inserting the second cylindrical section medially into the neck of the femur from beneath the greater trochanter and then inserting the first cylindrical section

25 into the neck laterally through the resected section left after resection of the head of the femur. The screw threaded first and second cylindrical sections of the femur fixture disclosed in WO93/16663 and WO97/25939, on the other hand, are integrally formed or pre-assembled prior to anchorage of the fixture in the femur neck by screwing the fixture into the femur neck laterally through the resected

30 section left after resection of the femur head.

In the femur fixtures disclosed in WO93/01769, WO93/16663 and WO97/25939 the first cylindrical section steps into the second cylindrical section. The stresses generated by this step arrangement are not ideal. The aim of the present invention is to improve the transition between the first and second cylindrical sections.

### Summary of the Invention

According to the present invention there is provided an implant of the type defined in which the first and second cylindrical sections are connected to one another by a tapered connecting section.

Ordinarily, the first cylindrical section will be disposed proximally of the second cylindrical section with the taper inclining inwardly in the distal direction, as in the embodiment hereinafter to be described.

As an example, the tapered connecting portion may have a frusto-conical profile, again as in the embodiment of the invention hereinafter to be described.

In an embodiment of the invention the first cylindrical section, the second cylindrical section and the tapered connecting section are each provided with a screw thread profile. Alternately, the first and second cylindrical sections may each be provided with a screw thread profile and the tapered connecting section left unthreaded.

Where the first and second cylindrical sections and the tapered connecting section are each provided with a screw thread profile, the height of the screw thread profile of the tapered connecting section may be less than, or essentially the same as, the height of the screw thread profiles on the first and second cylindrical sections.

In an embodiment of the invention such as the one hereinafter to be described one or more self-tapping cutting recesses are provided at least in part on the tapered connecting section.

The implant of the invention may be an orthopaedic implant, for example a femur fixture for a hip-joint prosthesis as in the embodiment hereinafter to be described.

By way of example, an embodiment of the invention will now be described with reference to the accompanying Figures of drawings.

#### Brief Description of the Drawings

Figure 1 is a side view of a femur fixture for a hip-joint prosthesis in accordance with the invention.

Figure 2 is a perspective view from above of the femur fixture.

#### Description of Exemplary Embodiment

The Figures of drawings show an integrally formed femur fixture 1 for a hip-joint prosthesis preferably made from commercially pure titanium and consisting of (i) an intraosseous anchoring section 3 of circular cross-section for insertion laterally into a bore hole of complementary profile drilled into the neck of a femur through a resected section made by resection of the head of the femur, and (ii) a head section 5 which will protrude from the resected section when the intraosseous anchoring section 3 is located in the bore for supporting a ball of the hip-joint prosthesis which interacts with the anatomical acetabular cavity or an acetabular part of the hip-joint prosthesis where a total hip-joint prosthesis is required.

The intraosseous anchoring section 3 has proximal and distal cylindrical portions 11, 13 of different outer diameter. The diameter of the proximal cylindrical portion 11 is greater than that of the distal cylindrical portion 13 and a frusto-conical connecting portion 15 connects the proximal and distal cylindrical portions 11, 13 to one another. The intraosseous anchoring section 3 further has a tapered terminal distal portion 9 contiguous with the distal cylindrical portion 13.

The outer surfaces of the proximal and distal cylindrical portions 11, 13 are each provided with screw threads (not shown) of the same pitch and height with the major diameters of the screw threads on the proximal and distal cylindrical portions 11, 13 being sized to be greater than the inner diameter of complementary cylindrical portions of the bore provided in the femur neck. Accordingly, the intraosseous anchoring section 3 is able to be anchored in the bore by screwing of the femur fixture 1 into the bore with the screw threads on the proximal and distal cylindrical portions 11, 13 threading into the bone tissue in the boundary wall of the bore. The diameter of the proximal cylindrical portion 11 is in fact sized such that the threads thereon register in the peripheral layer of cortical bone in the femur neck, as outlined in WO93/16663 and WO97/25939. The threads on the proximal cylindrical portion 11 are thus secured in the stronger cortical bone as opposed to the spongier cancellous bone thereby giving the femur fixture 1 greater fixation in the femur neck.

It should also be added that the axial length of the intraosseous anchoring section 3 is such that in the anchored position of the intraosseous anchoring section the distal end thereof projects through the lateral cortex of the femur.

Bridging the boundaries between the proximal cylindrical portion 11 and the frusto-conical connecting portion 15 and the distal cylindrical section 13 and the tapered terminal distal portion 9 are a series of equi-spaced, circumferentially-arranged cutting recesses or notches 14, 17 respectively which give the

intraosseous anchoring section 3 self-tapping capacity. The cutting recesses 14 which bridge the proximal cylindrical portion 11 and the frusto-conical connecting portion 15 each communicate with a channel 16 in the proximal cylindrical portion 11 for autologous transplantation of the bone cut by the cutting recesses 14 as the femur fixture 1 is screwed into the bore in the femur neck, as detailed in WO97/25939.

The head section 5 of the femur fixture 1 has a collar portion 27 which delimits the insertion of the intraosseous anchoring section 3 into the bore in the femur neck by abutting with the resected femur section adjacent the opening to the bore and a frusto-conical portion 19 for the ball component of the hip-joint prosthesis to be mounted on.

The surgical procedures described in WO93/16663 and WO97/25939 for implanting the femur fixtures disclosed therein can be adapted for implantation of the femur fixture 1 and as such are incorporated herein by reference.

The anchorage of the femur fixture 1 is solely reliant on the registration of the threads in the bone of the femur, principally the registration of the threads on the proximal cylindrical portion 11 in the cortex of the femur neck and the registration of the threads on the distal cylindrical portion 13 in the lateral cortex of the femur. This is in distinction to femur fixtures which rely on a thrust plate mechanism for their fixation, for example as in GB-A-2033755.

The femur fixture 1 herein described with reference to Figures 1 and 2 can be varied in numerous ways within the scope of the invention. For instance, the frusto-conical connecting portion 15 could be roughened for improved integration thereof with the bone tissue boundary wall of the bore (termed "osseointegration"). As an example, the surface roughening may be achieved through grit-blasting or by machining a circumferentially-oriented roughness

thereon, e.g. grooves, tracks, beading or screw threads. Alternately, the frusto-conical connecting portion may be left smooth, even polished. The femur fixture 1 could also be in the form of an assembly in which the component parts are assembled (i) for insertion thereof laterally into the bore as a one-piece structure, 5 as disclosed in WO93/16663, or (ii) by connecting the parts together in the bore, as disclosed in WO93/01769.

It will be appreciated that the invention has been described with reference to an exemplary embodiment and that the invention can be varied in many different 10 ways within the scope of the appended claims. For instance, the implant is not confined to use as a femur fixture for a hip-joint prosthesis. As an example, the implant could take the form of a bone fixation screw. It will further be appreciated that the use in the appended claims of reference numerals from the Figures of drawings is for the purposes of illustration and not to be construed as having a 15 limiting effect on the claims.

Claims

1. An implant (1) for a bone tissue structure having an intraosseous anchoring structure (3) of a generally circular cross-section comprising a first cylindrical section (11) of a first diameter and a second cylindrical section (13) of a second diameter less than the first diameter characterised in that the first and second cylindrical sections are connected to one another by a tapered connecting section (15).
2. An implant as claimed in claim 1, characterised in that the first cylindrical section (11) is disposed proximally of the second cylindrical section (13) and that the tapered connecting section (15) tapers inwardly in the distal direction.
3. An implant as claimed in claim 1 or claim 2, characterised in that the tapered connecting portion (15) has a frusto-conical profile.
4. An implant as claimed in claim 1, 2 or 3, characterised in that the first cylindrical section (11), the second cylindrical section (13) and the tapered connecting section (15) are each provided with a screw thread profile.
5. An implant as claimed in claim 1, 2 or 3, characterised in that the first and second cylindrical sections (11, 13) are each provided with a screw thread profile and that the tapered connecting section (15) is unthreaded.
6. An implant as claimed in claim 4, characterised in that the tapered connecting section (15) is provided with a screw thread profile of a height less than that of the screw thread profile on the first and second cylindrical sections (11, 13).



7. An implant as claimed in claim 4, characterised in that the heights of the screw thread profiles on the first and second cylindrical sections (11, 13) and the tapered connecting section (15) are essentially the same.
- 5 8. An implant as claimed in any one of claims 1 to 7, characterised in that one or more self-tapping cutting recesses (14) are provided at least in part on the tapered connecting section (9).
9. An implant as claimed in any one of the preceding claims,  
10 characterised in that the implant is an orthopaedic implant (1).
10. An implant as claimed in claim 9, characterised in that the orthopaedic implant is a femur fixture (1) of a hip-joint prosthesis.
- 15 11. An implant (1) for a bone tissue structure substantially as herein described with reference to and as illustrated by the accompanying Figures of drawings.

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ABSTRACTImplant

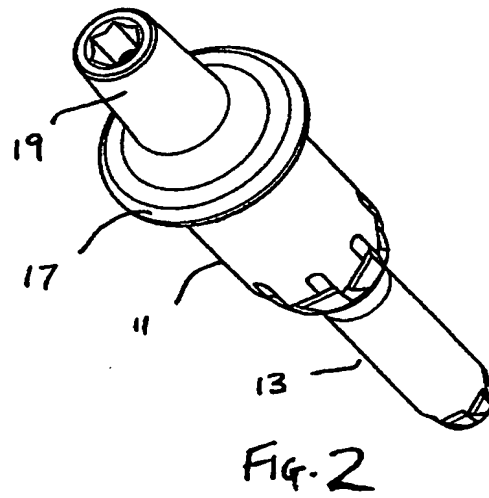
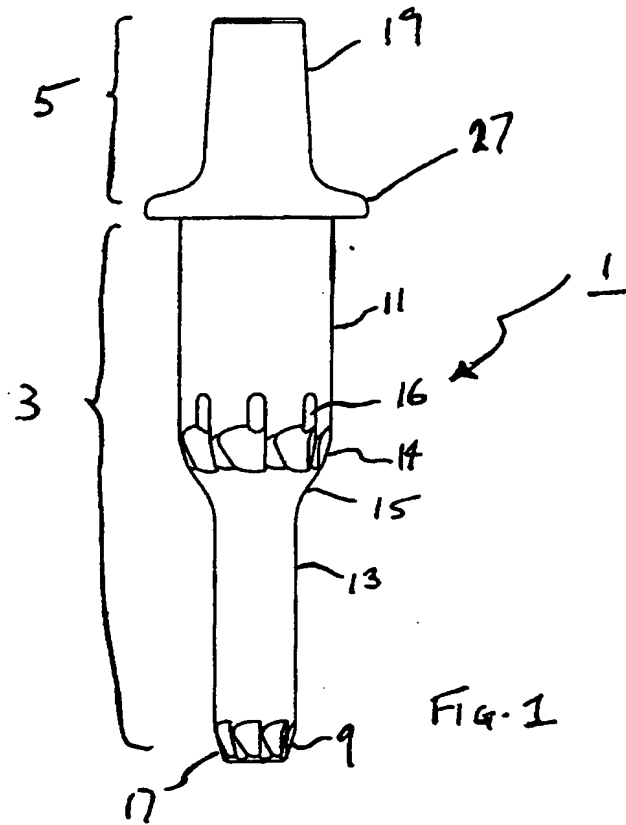
- 5 An implant (1) for a bone-tissue structure having an intraosseous anchoring structure (3) of a generally circular cross-section comprising a first cylindrical section (11) of a first diameter, a second cylindrical section (13) of a second diameter less than the first diameter and a tapered connecting section (15) which connects the first and second cylindrical sections to one another.

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